

How safe is safe enough?

George Bearfield
United Kingdom
Rail Safety and Standards Board

Abstract

In the United Kingdom railway industry decisions must be taken that balance the demands of safety with those of performance and cost. Managers and engineers need clear guidance that shows them how to take decisions that both meet their legal duties and support the running of a sustainable business. The process needs to give decision-takers confidence that their decisions will be defensible and also that they effectively take into account society's expectations of what the railway should deliver.

The Rail Safety and Standards Board's Safety Decisions Programme was initiated to provide this guidance. The programme has developed publications to clarify existing requirements, highlight uncertainty and propose refinement to the approach to decision-taking. The paper presents these findings and proposals and describes how the Programme is taking them forward, in support of the combined economic and safety regulator's work to ensure that regulations and industry practice are rational, coherent and effective.

1 The Safety Decisions Programme

The Safety Decisions Programme was established in November 2003 and is managed on behalf of the UK railway industry by the Rail Safety and Standards Board (RSSB). The work of the programme seeks to achieve clarity in the process for taking decisions in the industry. The programme was set up, in response to requests from within the industry, in order to:

- establish a common understanding amongst internal and external stakeholders as to what the railway is expected to deliver with regard to safety.
- develop a trusted framework of processes and criteria for safety decision makers to apply.
- achieve clarity and stability in the safety governance of the railway.

The programme seeks to achieve these objectives by bringing together research, consultation and deliberation to find a way forward on all aspects of proper decision-taking as it affects safety. The programme reached a significant milestone in February 2005, when the document 'How safe is safe enough?' (HSISE) was published on behalf of the industry. The document presented an overview of how British railway companies take decisions that can affect safety and identified a number of outstanding issues where further work and research were required. Following the publication of HSISE, three work streams were begun to resolve these outstanding issues:

- Decision-Taking Framework – providing a structured process for taking decisions that formalises and builds on existing good practice.
- Valuing Safety – proposing a framework for measuring society's values and identifying when to factor these appropriately into decisions.
- Legal Certainty – a review of the legal position emerging from statute and case law, identifying the uncertainties that exist and seeking clarification (for example on the interpretation of "gross disproportion").

In the following three sections of this paper we explain some of the key concepts and ideas that were raised by those workstreams.

2 A framework for taking decisions

What is reasonable is as much about the process by which you reach your decision as the decision itself. The decision-taking framework [2] is a process, distilled from existing practice, that

helps industry stakeholders to navigate their way through a problem to quickly and effectively reach a decision. It is not a mechanistic recipe, rather it suggests the stages that the decision taker might choose to follow and identifies the issues that need to be considered at each stage of the decision. The framework is to form the backbone of future industry guidance that is being developed by the Programme.

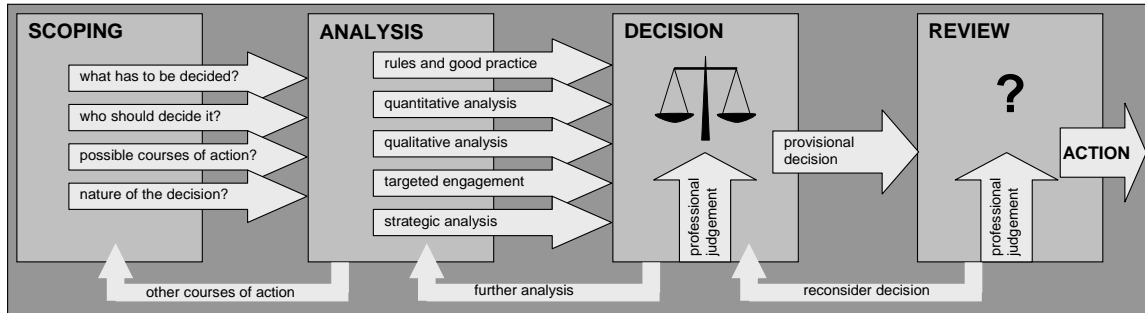


Figure 1: Stages in the taking of a decision

Application of the process begins with the recognition within an organisation that a decision needs to be taken. This could arise through a variety of means, for example via the application of the organisation's safety management system, or a local complaint made about a particular issue. To take a particular decision four basic steps are outlined (see Figure 1).

2.1 Scoping the decision

First the decision must be scoped. This involves considering what type of decision is being addressed. Is it an immediate operational decision or more of a managerial decision? Who is responsible for taking the decision? Will in depth analysis be needed to support the decision? To help address these and a range of other questions, a decision taking chart is presented (see Figure 2). This chart indicates the extent of different analysis methods that might be applied for decisions of different complexity. The analyst should determine the options and undertake any analysis necessary to choose between them.

2.2 Analysis of the decision

The chart of Figure 2 highlights a range of methods that may be applied to provide input to the decision taking process. The chart is based on a similar one developed by United Kingdom Offshore Operators Association (UKOOA) [3]. The diagram is wedge shaped to indicate that increasing problem complexity indicates that more resource should be allocated to each method. It provides a structured checklist of approaches that can be applied to obtain useful information with which to inform the decision. In summary the methods are:

- Rules and good practice.

Rules and existing good practice provide effective, easily accessible information about what measures in an organisation are likely to be sensible and effective. Undertaking measures which represent good practice is likely to result in a response which fulfils the legal requirements for reducing risk that are placed on an organisation.

- Quantitative Analysis/Qualitative Analysis

Where judgements have safety implications then, according to UK law, the relevant safety risks must be assessed and balanced against costs to take that judgement. Depending on the size and complexity of the problem this can be undertaken as a brief qualitative assessment or as a more detailed quantitative analysis.

- Strategic Analysis

In some instances decisions will have strategic effects that need to be taken into account. Decision taking is not an academic exercise, and real strategic difficulties associated with the decision need to be considered, such as the practical ability of the organisation to implement any change and the commercial interests of the company.

- Targeted Engagement

To take good decisions companies must engage with those who fund the railway, those who work within the railway and those who regulate the industry. The programme is seeking to develop guidance for when and how such consultation should be undertaken

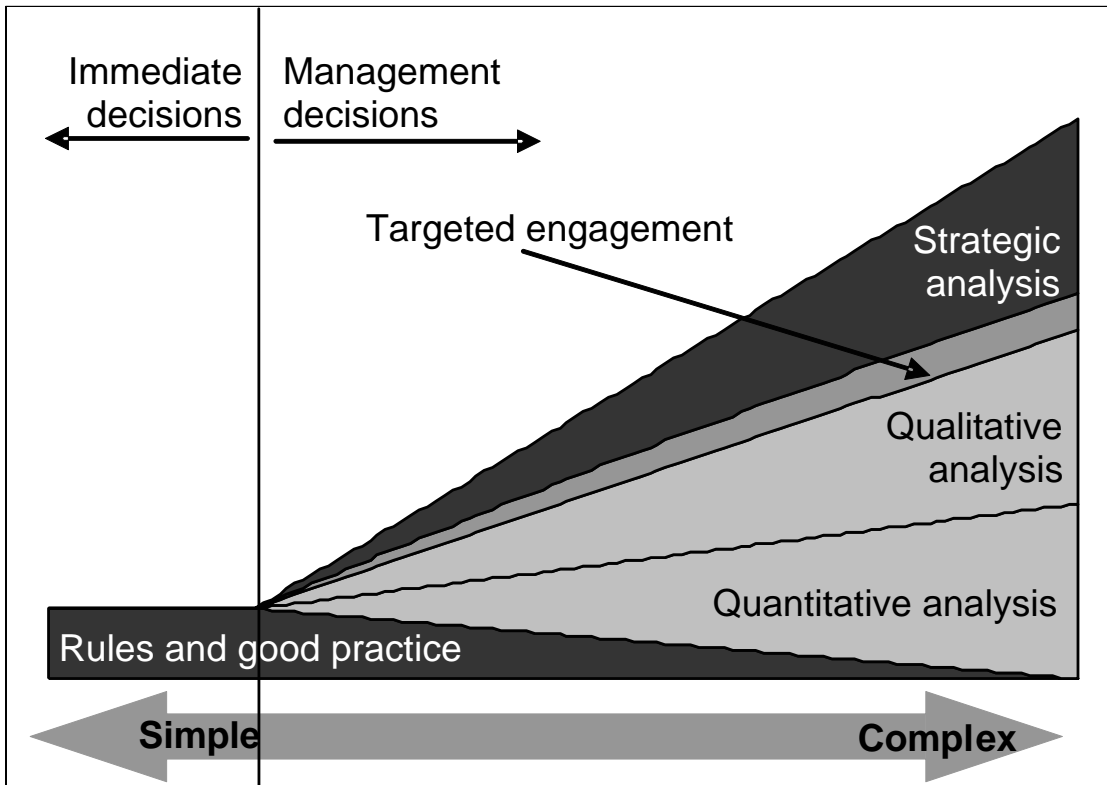


Figure 2: Diagram of methods that may need to be applied when taking decisions of varying complexity

2.3 Taking the decision

Once a decision has been scoped and analysis undertaken the decision maker is in a position to take the decision. There are certain key rules that the framework stresses. The first is that there is no such thing as a pure safety decision. The decision will need to take appropriate account of cost, performance and safety. The overriding requirement is to take decisions, even if this means explicitly deciding to do nothing, and not to let actions happen by default.

2.4 Reviewing the decision

Does the decision make sense? The decision maker should consider whether they would feel comfortable explaining the decision, were an accident subsequently to occur. What were the reasons for taking the decision? Does it give due regards to the interests of all affected parties?

The framework itself is not controversial and provides a formalisation of the approach that is widely understood and adopted throughout the industry. However underpinning the application of the framework are a number of fundamental questions. How does the existing legal framework influence and affect what decision takers must do? How does society value safety and what are the implications of these values? These questions were the subject of related streams of work.

3 The legal issues surrounding safety

Since April 2006, safety regulation in the UK railway industry has been the responsibility of the Office of the Rail Regulator (ORR), which is also responsible for economic regulation. Prior to this time the Health and Safety Executive (HSE) undertook safety regulation and were supported in this work by Her Majesty's Railway Inspectorate (HMRI). According to UK law, companies must do all that is reasonably practicable to reduce risk. Determination of whether an action is reasonably practicable involves balancing its risks, costs and benefits. This approach stems from a legal judgement made by Edwards [4]:

"...a computation must be made...in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) is placed in the other, and that, if it be shown that there is a gross disproportion between them – the risk being insignificant to the sacrifice - the defendants discharge the onus on them."

However there is ambiguity in how this is translated into practice. The Edwards judgement offers no guidance on how to determine the degree of disproportion between safety benefits, and net financial costs that is appropriate in a particular circumstance. In the years preceding the handover of their railway responsibilities, the HSE produced various documents which sought to clarify how the law should be interpreted [5,6,7,8]. However these documents often added further confusion, by blurring the lines of responsibility between the regulator and companies in the industry, and by offering contradictory statements about what companies needed to do to meet their legal duties. Regulatory documents imply that the appropriate degree of disproportion is influenced by uncertainty in the assessment of risks and costs and also by 'societal concerns' about the type of risk being addressed. Another factor was introduced by the cross industry document 'Reducing Risk, Protecting People' (R2P2) [8] which described a framework for establishing whether the total risk experienced by individuals was within tolerable limits. There is no clarity as to which of these factors are relevant, and to what degree, in a particular circumstance. This creates difficulties for those in the industry who need to determine whether an action is reasonably practicable.

A report was recently issued by the Economic Affairs Select Committee, a committee of the upper house of the UK parliament, which echoed the need for improved clarity. The report, 'Government Policy on the Management of Risk [9], concluded:

"In our view, the use of ill-defined and ambiguous terms in risk management and regulatory documents is generally unhelpful. There is a danger that they can induce an excessively cautious attitude to risk. We recommend that terms such as ALARP, Gross Disproportion and the Precautionary Principle should be more clearly defined or replaced with more specific and unambiguous requirements and concepts."

4 Valuing safety

Comparison of the risk of an action and its net cost, as implied by the Edwards judgement, is not simple as risk and cost are not measured in the same units. In the UK railway industry risk is generally estimated in Fatalities and Weighted Injuries (FWI) per year. In order to make a comparison of risks with cost, the risk needs to be translated into a financial value. This is done using the industry 'Value of Preventing a Fatality' (VPF), a figure endorsed for use by the Department for Transport, which is currently £1.5 million per statistical fatality averted. This figure was originally developed from studies of what a selection of members of the public said that they

would be willing to pay for reduction in risk levels. It is a measure of what the average member of the general public is willing to pay to reduce the level of risk to the average victim.



Figure 3: Diagrammatic representation of the Edwards Judgement

When taking a decision the duty-holder needs to determine the appropriate degree of disproportion between net costs and risks.

Guidance about how this should be done was provided in R2P2. Individual risk is estimated as the risk applying to some hypothetical person. The tolerability of risk triangle (Figure 4) represents an increasing level of individual risk. Risk falling into the unacceptable region is considered to be unacceptable, regardless of the level of benefits associated with an action. The zone at the bottom represents the broadly acceptable region. Risks falling into this region are generally regarded as insignificant and adequately controlled. The zone between the unacceptable and broadly acceptable region is the tolerable region. Risks in that region are typical of risks from activities that people believe they are prepared to tolerate in order to secure benefits. For individual risks in the tolerable region to be acceptable they must be as low as is reasonably practicable. The tolerability of risk framework described in R2P2 implies that the degree of disproportion that should be applied increases with the magnitude of individual risk. There are two immediately apparent logical justifications for this:

1. The higher an individual risk is in the tolerable region, the more likely it is that, taking into account uncertainty in the risk assessment process, the risk is actually intolerable. A higher degree of disproportion is therefore required in order to err on the side of caution.
2. 'Societal concern' about individual risk increases with its magnitude and therefore the degree of disproportion applied increases to take account of this.

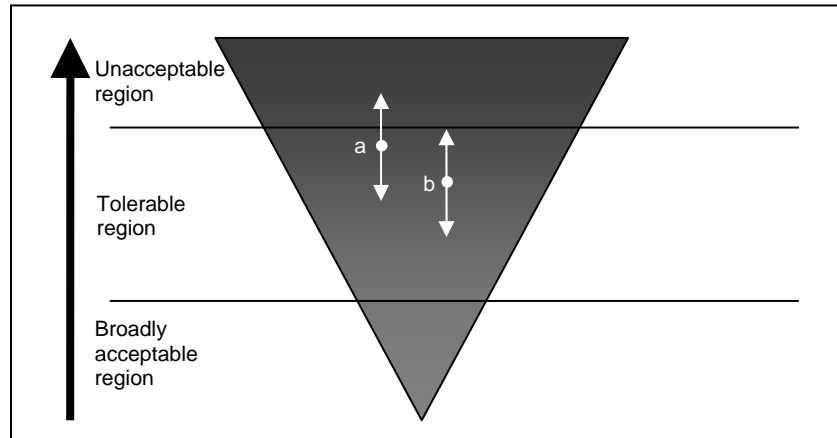


Figure 4: HSE framework for the tolerability of risk, showing tolerance limits on risk estimates and how these might be taken into account to determine an increase in the level of disproportion between risk and net costs.

The mechanism indicated by point 1 is illustrated in the diagram of Figure 4. If the individual risk is estimated to be at point a, with the degree of uncertainty shown on the diagram, there is the potential that the risk is actually in the unacceptable region. Therefore the risk must be lowered to point b to ensure that this is not the case. This rationale for increasing the expenditure to reduce risk is widely accepted amongst stakeholders as an acceptable reason for increasing the degree of disproportion between costs and the mid-point risk estimate. It does not imply any scaling of the VPF value – a fixed value can be used in all circumstances.

However the second rationale above (point 2) is more controversial. The higher the 'societal concern' about an accident the less tolerable it is considered. This thinking has historically been reflected in railway industry practice. Following a catastrophic train accident at Clapham Junction in 1988 a disproportion factor of 2.8 between costs and risks was adopted by the British Railways Board (BRB) for risk associated with multi-fatality train accidents. These accidents are associated with high levels of 'societal concern'. This figure was derived from research studies BRB had commissioned. Up until 2003/2004 stakeholders within the railway industry applied an approach that was consistent with this thinking using a multiplier of three. For other types of risk no multiplier was applied. After this time, on the advice of the Department for Transport, the industry stopped using this multiplier. They confirmed that the industry VPF should be applied in all circumstances when determining a company's legal duty.

There is an inconsistency here that needs to be resolved to clarify the decision taking principles that should be applied by duty holders. Taking 'societal concern' into account and adjusting the degree of disproportion because of it (as is proposed in R2P2 and explicitly outlined in HMRI guidance documentation [5]) is inconsistent with the use of a fixed VPF. If the degree of disproportion changes due to 'societal concern' the legal duty to reduce risk changes and this implies expenditure per FWI that differs from the mandated industry value of £1.5 million.

There are two obvious resolutions to this inconsistency. The first is for the regulator to clarify that 'societal concerns' are not to be taken account of by duty holders and therefore do not need to be considered. This would mean that railway companies could choose whether or not to invest additional resources to take account of 'societal concern' but they would not be legally mandated to do so. The regulator or Government could respond to such concerns by regulation, but in these circumstances railway companies would not be expected to fund such measures.

If duty holders are, in fact, expected to take such factors into account they need much better guidance about how to do so. The argument for such an approach is that the current VPF is an average value, and is therefore not sensitive to any variability in society's views. Therefore there

is an argument that it is not in all circumstances representative of what society believes to be reasonably practicable. The 'Valuing Safety' work stream explored how this approach could be addressed in practice. It investigated how peoples' underlying values about safety, and their preferences for safety investment varied with the circumstances of an accident and how this variability could be measured. It proposed ways in which people's values could be better understood, and effectively built into the decision taking process.

If there are other reasons for changing the degree of disproportion in certain circumstances these need to be made explicit. The approach to be adopted is ultimately the decision of the regulator. They need to confirm what principles decision takers should apply. However the approach decided upon needs to be coherent. The same fundamental principles apply to decision making whether a decision is based on a brief assessment of risk, or a detailed analysis and incoherence in the principles makes it impossible for a railway company to confidently decide how to proceed in a particular set of circumstances.

5 Findings of industry consultation

In spring 2006 a programme of consultation was undertaken to gauge the views of industry stakeholders on the difficult issues raised by the work of the programme. The consultation exercise found that those within the UK railway industry who were expected to understand and apply principles like 'gross disproportion' and 'reasonable practicability' were often uncertain of how to do this. A number of key questions were raised which are summarised in the following sub-sections:

5.1 Gross Disproportion

- What degree of disproportion between risks and net costs is considered 'gross'?
- Is the degree of disproportion applied intended to reflect variation in societal values associated with certain types of risk?
- Is the degree of disproportion applied intended to account for any uncertainty in the assessment of risk?
- Is application of the tolerability of risk framework a legal requirement for duty holders? If so, how should it be applied?
- Is the degree of disproportion applied intended to account for the magnitude of individual risk? If so why?

There is a strong view within the industry that the concept of 'gross disproportion' is a legal anachronism. The industry now has a far greater ability to estimate risk, and uncertainty in risk. Therefore the precautionary nature of applying 'gross disproportion' to err on the side of caution is less justified. A proportionate approach – where the duty holder would need to judge whether or not the net costs of an action are proportionate to the change in risk, and would act where the costs were not disproportionate – would be preferred. 'Proportionality' is accepted within UK government as being one of the key principles of good regulation and there are strong logical and legal arguments for accepting an approach based on proportionality.

If the concept of 'gross disproportion' is to be retained clarity is needed about how to apply it. There are many circumstances where it is not obvious what a company needs to do to meet their legal duty. For example decisions often need to be made which involve the application of new technology, where no relevant accident and incident data exists and potential risks have to be predicted. Similar difficulties arise when taking decisions which relate to the risk of high consequence, low likelihood accidents (such as train accidents). In such instances the company will often need to apply a rigorous assessment process to determine what actions are reasonably

practicable, and to do this effectively a clear description of the criteria that need to be met is essential. These criteria do not currently exist in the industry. The industry is not seeking a set of multipliers from the regulator. As outlined in section 4, they need the rationale which underpins the test of gross disproportion to be made explicit, so that they can decide on an appropriate response from first principles.

5.2 Wilful risk taking

- Under what circumstances does the control of risk lie outside of the duty holder's undertaking? Are there some circumstances where the risk to a third party who chooses to conduct unsafe acts on railway premises lies outside the undertaking?

There is uncertainty as to whether or not railway companies are responsible for risk arising to those who choose to conduct unsafe acts on railway premises. The actions of the industry, indicate that there is a view within the industry that there is a lesser duty to manage these types of risk.

5.3 Commercial considerations

- Under what circumstances might a duty holder choose to go beyond its legal duty?

Consultation found a strong consensus that there are circumstances where a duty-holder might choose to go beyond their legal duty. However the lack of clarity about how to determine the legal duty results in a blurring between the commercial and legal reasons for taking a decision. Ideally a duty-holder should know whether it has implemented a measure for business reasons or to fulfil its legal duty, so that it knows whether or not the measure could subsequently be removed. Where this is not clear, the danger is that a culture will result where legal duties are assumed which aren't really justified either by the spirit of the law or by practical needs. If the measures are considered to be legally mandated they cannot easily be removed. This will tend to lead to an increased cost base for the industry.

5.4 Issues of responsibility

- When and how should an issue be addressed by the coordinated response of a number of duty-holders, and when is it the regulator's responsibility to take a decision?

There are some instances where duty holders may have difficulty in managing safety on their own. In these cases a coordinated industry response is required. However there is little guidance for how this should be done and the industry needs further help in this area. There are also some decisions where the regulator and government need to act. This often occurs as a result of 'societal concern' about accidents, as was the case when the installation of the Train Protection and Warning System was legally mandated in the UK in the aftermath of a number of high profile train accidents. Some within the industry fear that confusion over these responsibilities leads to the placing of inappropriate responsibilities on stakeholders.

5.5 Overall findings

The overall findings of the consultation exercise were that there is significant confusion and uncertainty within both the industry and the regulatory community about precisely what the legal duty is for individual duty holders. Duty holders are also uncertain about what factors they need to take into account when determining whether risk has been reduced to a level that is as low as is reasonably practicable. Many duty holders perceive that this uncertainty results in an inconsistent approach to regulation, and duty holders are uneasy when taking decisions because of this lack of clarity. The duty holder may believe that the regulator acts reasonably on a day to day basis.

However there is a fear in the industry that, in the event of an accident, a different set of rules will be applied retrospectively when the regulator is itself under pressure from Government or the public. There is fear that such a shifting of the rules could result in unfair prosecution of the duty holder, or pressure to implement measures that are unnecessary and not cost effective. Risk aversion obviously results from such perceptions, whether they are justified or not. This lack of clarity is at the root of many of the industries problems.

6 The way forward.

The debate that has been instigated by the work of the programme has already resulted in significant progress towards the development of a coordinated and coherent position on the issues raised. There are some areas where it appears that there is emerging consensus in the industry:

- The disproportion factor applied in the determination of what is reasonably practicable is substantially to take account of uncertainty in the analysis of costs and risks.
- 'Societal concerns' should be an issue for the regulator to take into account, and not the individual duty holder – this implies that the degree of disproportion is purely to err on the side of caution in the assessment of risks and costs.
- A decision has two criteria: a business criterion and a safety criterion. There are circumstances where a duty holder may choose to go beyond their legal duty for business reasons, for example to take account of 'societal concern' and its potential effect on business.

However, a number of outstanding issues still remain to be addressed. During the consultation period the ORR informed RSSB of their commitment to engage formally with stakeholders during 2006/07 regarding their review of guidance on the interpretation of the concept of 'so far as is reasonably practicable' (SFAIRP), which has links to their enforcement policy in so far as 'gross disproportion' is concerned. This ORR review is providing us with an opportunity to progress our work, in particular the work stream focussing on achieving legal certainty and clarity, in a constructive partnership with the ORR. The ORR have also welcomed the opportunity to access the output of our consultation exercise as an input to their own review. We expect the ORR to produce their consultation document in February 2007.

We are now working with the ORR and industry to ensure that the content of HSISE2, the major programme deliverable that we are to produce, complements and is consistent with a clear statement of future regulatory policy.

7 References

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